## REMARKS

Responsive to the Office Action dated April 18, 2007, applicants request reconsideration of all grounds of rejection.

In Amendment B, applicants proposed to modify the formula for alum shown in paragraph 33 of the specification. In the subsequent Office Action, the Examiner objected to the proposed amendment of the specification as introducing "new matter." In Amendment C, applicants explained that the amendment is deemed unnecessary and requested that the proposed amendment be withdrawn. In the Office Action of April 18, 2007, the examiner pointed out that the amendment to the specification specified in Amendment B had been entered and that it had to be cancelled to remove it from the specification. Applicants have now done so.

Applicants have amended independent claims 5 and 9 to insert specific aspect ratios for the calcium sulfate alpha hemihydrate crystals, as suggested by SPE Johnson during the interview (described below). In each case the aspect ratio has been taken from one of the dependent claims and the dependent claim cancelled. Accordingly, the amendments do not involve any "new matter." As a result of the amendment, all claims now recite on specific aspect ratio for the calcium sulfate alpha hemihydrate crystals.

## THE INTERVIEW

Applicants would like to thank Examiner Butler and Supervisory Patent Examiner Johnson for the telephone interview on May 22, 2007 with Applicant Miller and applicants' attorney Donald E. Egan. During the interview applicants' attorney pointed

out that all of the claims in issue are in Jepson form wherein the Baig process is recited as the prior art. Specifically all claims require:

> mixing water, gypsum and a cellulosic fiber to form a dilute slurry;
>
> heating the slurry, under pressure, to form acicular calcium sulfate alpha hemihydrate crystals; and substantially dewatering the hot slurry before rehydrating the hemihydrate back to gypsum;

The claims in the case are divided into two groups, namely:
Claims 5 – 8 require either aluminum chloride or chlorine to be added to the slurry in order to Increase aspect ratio of the calcium sulfate alpha hemihydrate crystals.

Claims 9-14 require Alum to be added to slurry amount to increase or decrease aspect of the calcium sulfate alpha hemihydrate crystals.

During the interview, Dr. Miller described how the present invention originated. The early efforts to operate the Baig process on a large scale line initially produced a satisfactory product. However, from time to time, the process produced a product having an unsatisfactory low flexural strength. Dr. Miller was assigned to correct the problem. Dr. Miller discovered that organic contaminants were getting into the gypsum slurry, which caused the process to create short, blocky calcium sulfate hemihydrate crystals (i.e. crystals having low aspect ratios) and that the product containing the short blocky crystals had an unsatisfactory low flexural strength. The solution to the problem was to find something that would produce crystals with higher aspect ratios in the presence of the organic impurities. After extensive testing, it was discovered that alum, aluminum chloride and chlorine could be added to the gypsum slurry to produce calcium

sulfate hemihydrate crystals with high aspect ratios even when the organic contaminants were present. This solved the problem.

During the interview the main prior art references were also discussed.

US Patent 5,320,677 to Baig describes basic process set forth in all claims. At col. 6, lines 42-45, Baig states that "crystal modifiers" such as "organic acids" can be added to the slurry "to stimulate or retard crystallization or to lower the calcining temperature." Baig does not suggest the "crystal modifiers" have any impact on the aspect ratio of the calcium sulfate alpha hemihydrate crystals. In fact, Baig does not even mention the aspect ratio of the calcium sulfate alpha hemihydrate crystals.

US Patent 3,835,219 to Jaunarajs et al teaches a "METHOD FOR THE PREPARATION OF FIBROUS SOLUBLE CALCIUM SULFATE **ANHYDRITE**" (see title) having an aspect ratio in range of 10:0 to 100:1. Jaunarajs et al repeatedly states: "The suspension may also contain a small amount of a crystal habit modifier which is suitable for the formation of the fibrous soluble **anhydrite**." Actually Jaunarajs et al does not suggest modifiers have any impact on aspect ratio of crystals, but Jaunarajs et al does suggest the modifiers promote the formation of **anhydrite** crystals and exclude hemihydrate crystals. Jaunarajs et al also states the goal is to exclude the formation hemihydrate (See Col 1, line 30; and Col 2 lines 18-19). Incongruously, however; at one point, Jaunarajs et al refers to forming fibers of "soluble calcium sulfate hemihydrate" (Col 2, line 38-39). Applicants suggest that this is a typographical error.

During the interview, applicants' attorney argued that Jaunarajs et al was non-analogous art because it teaches the formation of different crystal, i.e. **ANHYDRITE** vs

**hemihydrate** and the crystals are used in a different product – No rehydration is required to use the Jaunarajs et al anhydrite crystals, but the applicants' claims specify that the hemihydrate crystals must be rehydrated to gypsum. It follows that one skilled in the art seeking to solve a problem in practicing the Baig process would not look to Jaunarajs et al to solve the problem.

During the interview, the Examiner was asked to explain further his statement that appears at top of page 17 of the Office Action of April16, 2007, to wit: "Since crystallization is growth of crystals, controlling the crystallization includes controlling growth. As Jaunarajs teaches the size to grow to and the aspect ratio, the controlled crystallization would control growth. Since the fibrous length grows, the calculated ratio would increase accordingly." The Examiner's explanation makes it clear that the Examiner is relying upon the crystal modifiers of Jaunarajs et al to teach increasing the aspect ratio of calcium sulfate hemihydrate crystals.

Beginning at Col 3, line 10: Jaunarajs et al list materials that are suitable for use as crystal habit modifiers: "The suspension may also contain a small amount of a crystal habit modifier which is suitable for the formation of the fibrous soluble **anhydrite**. These are generally acids such as boric, succinic, adipic, malonic, sebacic, and similar acids or their salts, as well as salts such as sodium chloride, sodium sulfate, aluminum sulfate, and zinc sulfate." However, the Jaunarajs et al list fails to mention either aluminum chloride or chlorine, which are specified by claim 5 and the claims dependent thereon.

The Henkels' Declaration (Paragraph 13) noted that the Jaunarajs et al examples illustrate that modifiers decrease aspect ratio, not increase the ratio as argued by the Examiner.

The Examiner argued that other chlorides specified by Jaunarajs et al would make obvious the aluminum chloride and elemental chlorine to increase aspect ratios as required by applicants' claims. Applicants suggested this position is in error.

Near the end of the interview SPE Johnson pointed out that some of the claims in issue do not specify a specific aspect ratio but merely referred to raising or lowering the aspect ratio. She suggested that claiming express aspect ratios might help distinguish over the prior art. Applicants agreed to consider her suggestion and have adopted it in the amended claims set forth above.

ARGUMENT

All of the claims in issue (claims 5 – 14) stand rejected under 35 USC §103 as being obvious based on US Patent 5,320,677 to Baig in view of US Patent 3,835,219 to Jaunarajs et al. Claims 9 through 14 further stand rejected under 35 USC §103 as being obvious based on US Patent 5,320,677 to Baig in view of US Patent 3,835,219 to Jaunarajs et al and a 1995 paper by Spiring. The principal issue underlying both rejections is whether Jaunarajs et al make obvious the use of aluminum chloride, chlorine or alum to increase the aspect ratio of calcium sulfate hemi-hydride crystals.

Jaunarajs et al teaches the generation of calcium sulfate anhydrite crystals instead of the calcium sulfate hemihydrate crystals as claimed by Applicant. As described in Ullmann's Encyclopedia of Industrial Chemistry, of 5th edition, Vol. A4,

Table 2, page 558, the crystalline lattice symmetry, lattice spacing, etc. are different between the calcium sulfate hemihydrate and calcium sulfate anhydrite crystals. As a result, a crystallographer skilled in the art of generating crystals would not expect the crystal habit modifiers taught by Jaunarajs et al to generate an acicular anhydrite crystal to generate the same properties in an acicular hemihydrate crystal.

However, following the Examiner's position that both crystals are the same, a second significant difference occurs in the methodology and goal of Jaunarajs and the crystal modifiers to achieve his desired result. Jaunarajs uses traditional crystal modifiers to force crystal growth to a shorter crystal using, for example succinic acid. Succinic acid is taught in the art as a "crystal habit modifier" for calcium sulfate (US Patent 4,309,391) and in particular as a "crystal growth inhibitor" (US Patent 2,907,668 to Nies) and more specifically to the smaller type of crystal (US Patent 2,448,218 to Haddon). Thus it is clear that Jaunarajs et al targets reducing the crystal aspect ratio and size to his desired range.

In contrast, the Applicants claim the opposite effect that Jaunarajs et al desires to promote with his use of the crystal growth inhibitors and crystal growth modifiers. In the Applicants' process, a variety of crystal growth inhibitors and crystal growth modifiers are already present as byproducts of the high temperature calcination process on the major components, in particular the wood or paper material. The alum, aluminum chloride and chlorine have been demonstrated in the Applicant's process to counteract these non-desirable modifier effects. In the Applicant's process, the discovered additives increase the crystal aspect ratio.

To further illustrate the differences between the two teachings, Jaunarajs teaches sodium chloride as a suitable crystal habit modifier for his process. The Applicants have found aluminum chloride as a suitable crystal habit modifier for their process. The Examiner' argues that one skilled in the art would recognize from Jaunarajs et al that any chloride could be used to achieve the aspect ratio in the Applicant's process. However in US Patent 2,616,789 to Hoggatt, calcium chloride is taught as an additive to produce a shorter, blockier crystal of calcium sulfate. Calcium chloride is unsuitable and unusable in the Applicants' process. The aluminum chloride in the Applicants' process modifies the shorter blockier crystal tendency to longer higher aspect ratio crystals as desired.

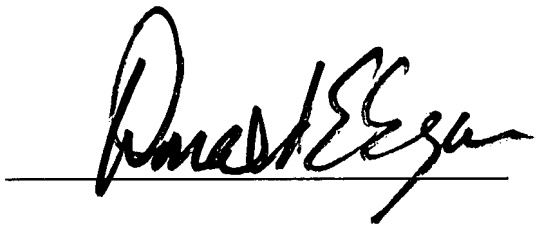
One contrast between the two process and teachings deals with the system each process starts with prior to the addition of the crystal growth modifier. In Jaunarajs et al, the process tends toward very long, very high aspect ratio crystals that apparently are unsuitable for his end use. Jaunarajs et al teaches how to counteract the tendency to grow the long high aspect ratio crystals by using crystal habit modifiers to produce shorter crystals. In the Applicants' process, the unwanted organic impurities produce short, blockier crystals that cannot mechanically interact with the other components in the mixture to achieve the desired fibrously reinforced matrix of the end product. As a result, Applicants teach how to counteract the tendency to grow the shorter, blockier crystals into higher aspect ratios more compatible with the Applicants' process. The different processes and different starting conditions dictate different modifier tendencies to achieve the end results: shorter blockier crystals for Jaunarajs and longer higher

aspect ratio crystals for the Applicants. Jaunarajs et al brings the crystal aspect ratio tendency **down** into the 10:1 range and the Applicants bring the crystal aspect ratio tendency **up** into the 10:1 range.

Accordingly, it is submitted that Jaunarajs et al does not make obvious the use of aluminum chloride, chlorine or alum to increase the aspect ratio of calcium sulfate hemi-hydride crystals and that the claims, as amended, are patentable over the prior art. Reconsideration of all grounds of rejection is respectfully requested and an early notice of allowance is solicited.

Respectfully submitted,

June 18, 2007



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